



United States
Department of
Agriculture

Soil
Conservation
Service

P. O. Box 40
Grants, New Mexico
87020

July 9, 1980

Christopher E. Sanchez
Reclamation Engineer
New Mexico Operations
P. O. Box 638
Grants, New Mexico 87020

Confidential Claim Retracted

Authorized by: SC

Date: 6/25/13

Dear Chris:

I am submitting this vegetative production report as requested. Feel free to contact us if any further question arise.

Sincerely,

Ken Walker

Ken Walker
District Conservationist
Soil Conservation Service

Attachment



CONFIDENTIAL



9389011

POL-EPA01-0007204

ANACONDA COPPER COMPANY
P. O. Box 638
Grants, New Mexico 87020

The range condition survey recently completed on Anaconda's Jack Pile uranium mine was made to determine if reclamation work on mined areas will return the land to its former vegetative condition. In order to make this comparison, clipping studies were done on undisturbed areas which had experienced very little grazing pressure. In order to make our comparisons as reliable as possible, the disturbed and undisturbed areas were selected with very similar physiographic, topographic and climatic conditions. Some problems encountered were introduced grass species seeded for reclamation including weeping lovegrass and crested wheatgrass.

Soils correlation will be difficult because reclaimed areas (dumps) used available material (sandstone) and by mechanical means crushed this parent material for the soil that was used as the planting medium. Results of the clipping data on the undisturbed sites shows:

Site 1 - Mesa top loamy upland site. Ecological condition of this undisturbed site is good. Major species of this area were; Galleta, Blue Grama, Bottlebrush Squirreltail and Three Awns. Also present but in a very small amount was Western Wheatgrass and Spike Muhly. Production was determined at 497 lbs./ac. Suggested initial stocking rates for this area according to the above data is six animal units per section or, 8.5 acres per animal unit month. (Animal unit is equivalent to a mother cow and calf or approximately 1000 lbs.)

This stocking rate is based on areas of similar topography, soils, and production. It is important to note that this capacity was determined considering no problems in access or distribution of livestock. The fact is however, that access to this area is limited and distribution of livestock may be a problem, because of water distribution and location in relation to the grazing area.

The clipping study on the reclamation areas centered on three different stages of revegetation. Site one (1) had been established for one year. Site two (2) had been established for approximately three years and Site three (3) was the oldest area and had been established approximately five years ago. This method of evaluation was used to determine if, for a typical situation, a pattern could be established as to the success of reclamation of the area. Again, similar topographic, climatic and physiographic areas were used. Other results of the clipping study shows that Site one (1) was predominately annual vegetation. There was evidence of success on establishing Western Wheatgrass, Sidecoats Grama, Weeping Lovegrass and Fourwing Saltbush. Indian Ricegrass, Blue Grama, and Bottlebrush Squirreltail are all present in small amounts.

Site 2 - Shows an appreciable decrease in the production of annual vegetation. Blue Grama, Alkali Sacaton and Fourwing Saltbush were the dominant forage producers.

Site 3 - Blue Grama, Indian Ricegrass, Sidecoats Grama and Three Awn are the major grass species with Fourwing Saltbush also prominent.

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Page 3.

The trend would tend to show that initial establishment of a reseeded area would comprise of annual vegetation followed by establishment of introduced grasses such as; Weeping Lovegrass and Crested Wheatgrass. Over a period of time, these would be replaced by native vegetation. This shows to be the case in this instance and would be expected under controlled conditions such as we experienced.

For stocking comparisons, we used Site three (3) as a guide since it was the oldest established area and would tend to give better information. On this basis we determined from production and composition initial suggested stocking rates of 6 animal units per section or 9.0 acres per animal unit month. This would allow us to conclude that revegetation of this area can provide comparable production to undisturbed surrounding areas. The increased shrub composition including Fourwing Saltbush, Snakeweed, and other shrubs should provide increased nesting sites and cover for wildlife such as; quail, doves, songbirds, and rodents. The distance to water should not be a detriment to wildlife.

Ken Walker

KEN WALKER
District Conservationist, SCS

Jerry Reiloux - Range Conservationist
Robert Abercrombie - Range Conservationist
Wilbur Lewis - Environmental Division Anaconda Co.

RANGE CONDITION WORKSHEET

Location H 1 Near Top. Range Site Lomny Uplands
 Structure (Grassland Tillar) L. R. A. WP-2
 Operating Unit _____ Date 6/19/80 By P. A. Thompson

Species	Present Production Occular Est. Double Sampled Pounds Per Acre ✓ Kilograms per Hectare _____	Present Percent of Total Production	COMPOSITION Allowable 1/	Counted in Condition Rating
Grasses				
<u>Twisted grass</u>	<u>1</u>	<u>3</u>	<u>3 -</u>	<u>3</u>
<u>Galata</u>	<u>67</u>	<u>13.5</u>	<u>15 5</u>	<u>15 5</u>
<u>W. Wheat</u>	<u>1</u>	<u>3</u>	<u>3 10</u>	<u>3 3</u>
<u>Blue Grass</u>	<u>94</u>	<u>19</u>	<u>15 20</u>	<u>15 20</u>
<u>Squirrel tail</u>	<u>150</u>	<u>30</u>	<u>15 10</u>	<u>15 11</u>
<u>Pink Mistle</u>	<u>20</u>	<u>4</u>	<u>3 -</u>	<u>3</u>
<u>3 dm</u>	<u>105</u>	<u>21</u>	<u>3 4</u>	<u>3 5</u>
<u>Spiky Mistle</u>	<u>1</u>	<u>3</u>	<u>3 4</u>	<u>3 5</u>
Shrubs, half shrubs, vines & trees				
<u>Snake weed</u>	<u>10</u>	<u>9.5</u>	<u>5 5</u>	<u>5 5</u>
Shrubs				
<u>Annua</u>	<u>16</u>	<u>3.3</u>	<u>3 5</u>	<u>3 3.2</u>
				<u>119.7</u>
Total	<u>4197</u>	<u>100</u>	<u>59</u>	

Range Trend Up ☒ Down ☐ (See reverse)
 Range Condition (Ecological) 59
 Plant Density 20 % Range Condition Class Good

See Natural Potential Plant Community section of Range Site Description. Not to exceed the upper limit of the approximate range in % composition for the individual species.

Plant Density 20

	W. White	Pink	Spruce	Pine	Shrub	Decid.	Birch	Maple	Tumbleweed		
1.											
2. 5g	1	7	20	20	8	T	1	1			
3. 5		5	20		15	7	2				
4. 8			25		5	2	20				
5.			21		4		45				
6. 1	T	20	5		3	T	11				
7. 6			29		2	1	1		1		
8. 10			12		8	2					
9. 6		25			T	3	14				
10. 6		37	5		2	T	10				
11. 20			3		2		1				
12.											
13.											
14.											
15.											
16.											
17.											
18.											
19.											
20.											
Total	1	94	150	20	42	16	105	1	1		
Ave.	.1	9.4	15.	2.0	4.2	1.6	10.5	.1	.1		

GUIDE FOR DETERMINING TREND;
(Sec. 370.1 - National Range
Handbook)

Long Term Indicators	4	3	2	1	0
Plant Vigor		X			
Reproduction		X			
Composition Changes		X			
Plant Residue	X				
Soil Surface Conditions		X			

Sub-Totals

RANGE TREND:

Improving (10+)

Declining (-10)

METHOD FOR DETERMINING RADON FLUX

Monitoring Procedure

monitoring methods, with several possible variations on each, are considered for use at Jackpile-Paguate. Method I incorporates features of the techniques used by Kraner, et.al., (1964) and E. J. et.al., (1975). Their flux determinations are derived from parent and progeny activity measurements of radon samples withdrawn at short time intervals from large containers sealed into the ground. It is assumed that the radon concentration buildup in the container (and therefore the samples) is linear with time, since the total sampling times are short compared to the half life of radon (3.8 days).

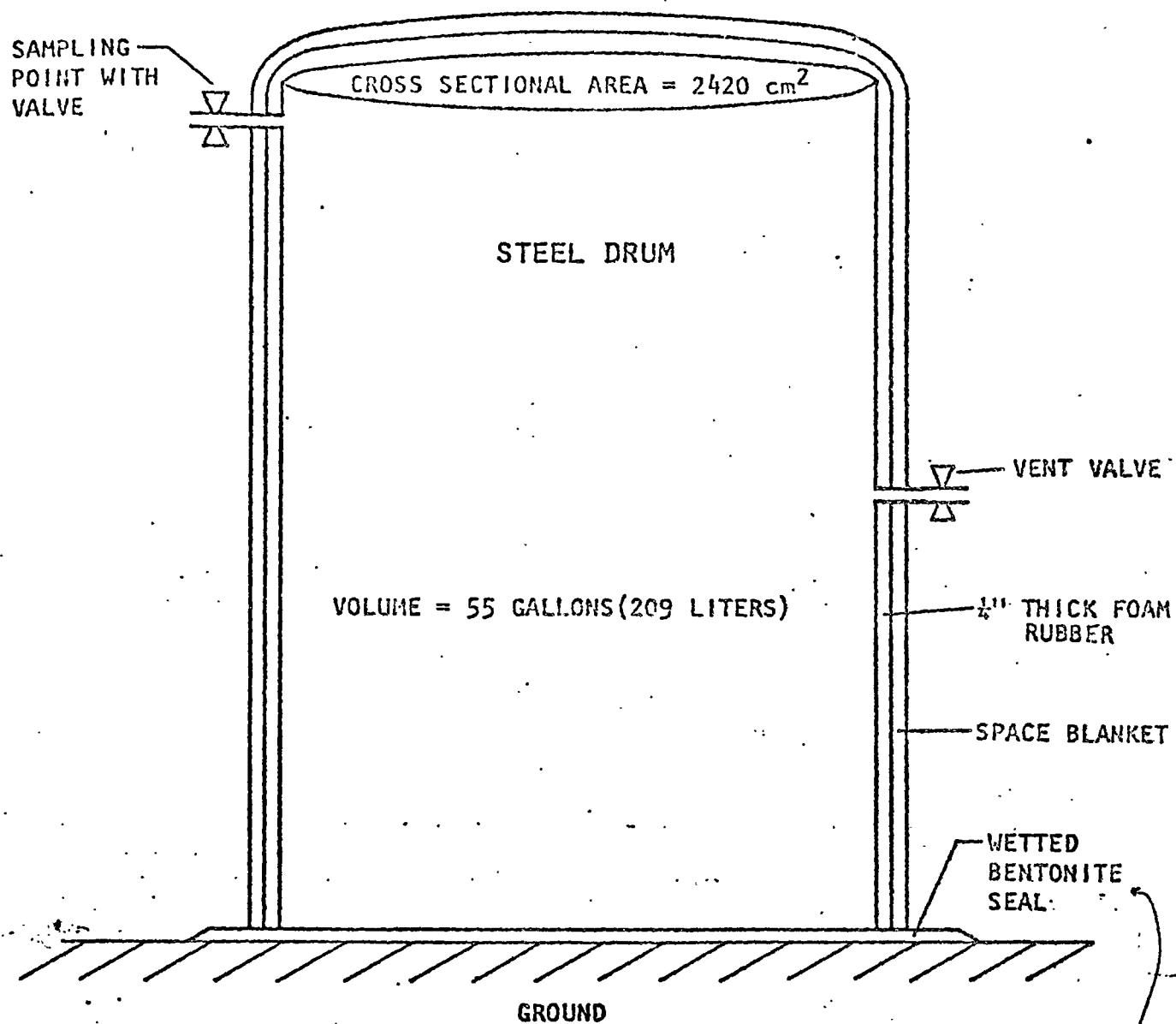
Method I

— This is the Method presently used

Method I requires a 55-gallon (209 liters) open-ended, modified steel drum whose open end is sealed into the ground for Rn collection (E. J. et.al., 1975). This container is depicted in Figure 3.1. The container has two attached vacuum valves. The top valve (vent valve) is opened before the container is sealed into the ground and remains open during radon collection. This open valve is necessary to maintain gross pressure equilibrium with the free atmosphere (Kraner, et.al., 1964). The other valve remains closed until sampling. External portions of the container are wrapped with 2.5 cm of foam rubber which is in turn overlain with a "space blanket" (combination of aluminum and mylar). This insulation should limit temperature variations within the container to less than 2° C (Kraner, et.al., 1964). It is noted the absence of Rn concentration gradients in similarly constructed aluminum coated, polyethylene containers during collection over several hours. The presence of a fan within the container to insure uniform gas mixing is thus deemed unnecessary.

Fiberglass insulation is used 4" rating

A flat, continuous ground area with no large rocks should be selected at the measurement station for container installation. The open end of the container should be placed against the ground and dry.



*Sand/soil
OK*

FIGURE 3.1 RADON COLLECTION CONTAINER

*Sand or soil seal is acceptable
seal according to Bernhardt
(EPA) author of method, phone
conversation*

Soil used to seal

bentonite sprinkled around the container rim. The bentonite should then be moistened to provide a good wet seal. Sampling can begin four hours after installation to allow for a sufficient amount of radon buildup.

Air samples from the container are collected in 1.4 liter internally ZnS coated scintillation cells that have two attached vacuum valves (Eberline SC-6 Scintillation Cells). Sampling of the container air is accomplished by first attaching a scintillation cell, that had been previously flushed and sealed with aged nitrogen, to the container and pump as shown in Figure 3.2. Between the container and scintillation cell is a vacuum hose line containing a desiccant and a glass wool filter. The desiccant prevents water from entering the scintillation cell. The glass wool filter removes radon progeny from the sample gas being pumped into the cell. A battery powered pump with an attached flowmeter serves the purpose of pumping a known amount of sample through the scintillation cell. A sample is taken by opening all three valves on the line and then turning the pump on for half a minute with the flow rate adjusted to 10 liters/min. The pump is then shut off and the three valves closed. The scintillation cell is removed from the line (with both its valves remaining closed) and properly labeled with a sample number and the time of measurement. Samples should be taken at 45 minute intervals for three hours. The line should be detached after the series of sample measurements at a given station is completed. Three to five hours should elapse after sample collecting before counting is begun. This allows radon to almost reach equilibrium with its daughters in the samples (Eberline, 1977)

Sample radon concentrations can be determined via an Eberline SAC-R5 alpha scintillation counter (or equivalent) which feature a five inch diameter photomultiplier tube mounted face up in a light tight enclosure (Eberline, 1977). This is attached to an Eberline MS-2 portable scaler by a coaxial cable. In order to count a sample the room lights should be turned off and the coaxial cable discon-

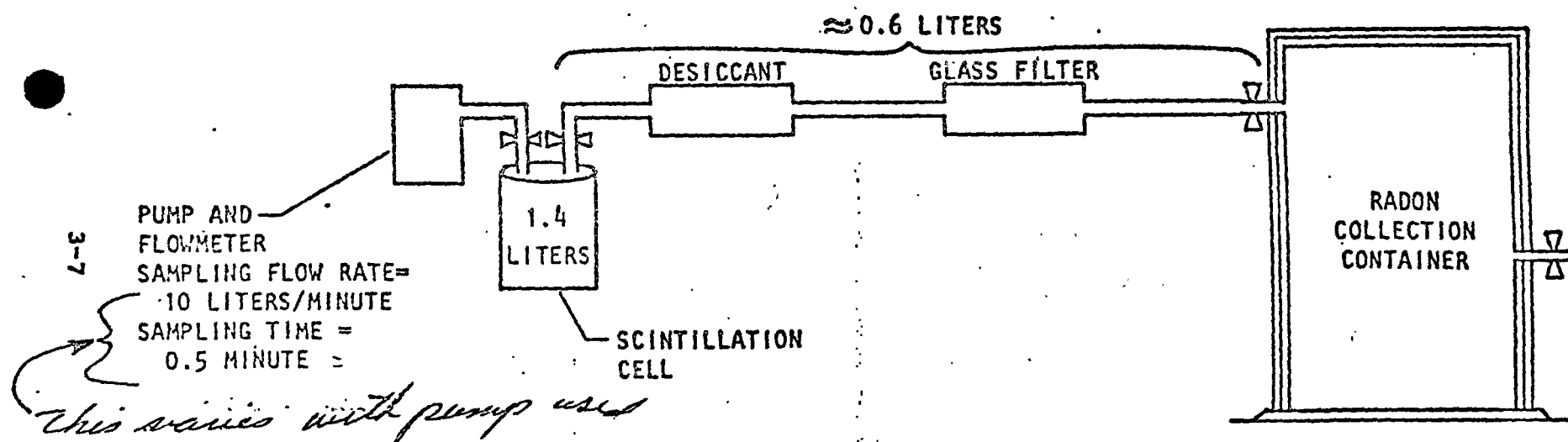


FIGURE 3.2 RADON SAMPLING APPARATUS

nected. A sample Rn scintillation cell is then placed into the detector chamber. After the removable chamber cover (1/2 metal shield) is replaced back onto the counter, the lights can be turned back on and the scaler reconnected. This procedure should be followed whenever a sample or standard is put in or taken out of the counter. The scaler should be set up for at least a thirty minute count for the sample cell. Upon completion of the reading the rest of the samples are to be counted. Prior to initiating the field sample collection, blanks should be run for thirty minutes on all cells which have been flushed and sealed with aged nitrogen. Background counting should be again performed on all used cells subsequent to aged nitrogen flushing for reuse. Upon completion of the sample and background counting, an Eberline DNS-4 certified Th-230 source should be placed in the counter on top of a piece of ZnS paper and a thirty second count performed. The observed counting rate should then be divided by the specific counting rate listed for the standard to provide a measure of quality control on detector electronics. If marked changes in these values are observed between counting sessions, recalibration of the system may be necessary.

not used
two (2)
20-minute
counts

Net measured sample activities are obtained by subtracting the appropriate background reading from each sample activity. Net measured sample activities in cpm can be converted to net measured Rn activity concentrations in units of pCi of Rn/l for the 1.4 liter cells by dividing these activities by 5.5. The conversion factor of 5.5, as calculated by the manufacturer of the proposed counting system, takes into account the counting efficiency, cell volume, and a correction for progeny disintegrations. These values are then plotted against the time after start of Rn accumulation in the container (in minutes). A best-fit line through the data is found by linear regression analysis (Bernhardt, et.al., 1975). The radon exhalation flux in $\text{pCi/cm}^2\text{-sec}$ can be obtained from the slope of the best fit line (pCi/l-min) by the following relation:

$$\text{radon exhalation flux (fCi/cm}^2\text{-sec)} = \text{slope of the best fit line} \\ (\text{pCi/min-1}) \times \frac{V}{A_c} \times \frac{\text{min}}{60 \text{ sec}} \times \frac{10^3 \text{ fCi}}{\text{pCi}}$$

where V = container volume in liters

A_c = container cross sectional area (cm²)

Site climatic conditions (temperature, barometric pressure, and precipitation) should be recorded from the nearest meteorological observation station for the entire period of radon collection. This information should be considered during the data analysis.

One possible variation in the above described method of determining radon exhalation fluxes is the use of a modified igloo cooler* *not used* instead of the steel drum. Igloo* coolers are 10 gallon cylindrical containers (approximately 18 inches in diameter) with faucet valves and are commonly used as water coolers. The hollow walls are constructed of aluminum and have plastic thermal jackets inside. The container can be adapted to Rn collection usage by adding another valve.

Advantages of the cooler are that it is easily obtainable, requires less modification than the steel drums, and perhaps provides better insulation than the wrapped steel drum.

It may be found, especially in the case of smaller volume igloo coolers, that the open vent valve may cause a problem during sample collection. Outside air may be sucked through the container into the scintillation vial during sampling regardless of the wide spacing between the two container valves. This possibility should be investigated and it might perhaps be necessary to leave out or close the vent valve on the modified igloo cooler.

Method I can be summarized to consist of the following consecutive operational steps for a given station:

* Registered Trademark

1. While still in the laboratory aged nitrogen should be flushed through and sealed into the 1.4 liter scintillation cells to be used for sampling and background should be measured with a thirty minute count following procedures outlined in steps 12-16.
2. A flat, continuous ground area with no large rocks should be found at the measurement station for container installation.
3. The open end of the container should be placed against the ground and dry ^{soil} bentonite sprinkled around the container rim. The container rim should not be "shoved" into the ground and site disturbance should be kept to a minimum.
4. The ^{soil} bentonite should be moistened to provide a good wet seal.
5. Sampling of the container should begin four hours after installation. The time at which the container is installed should be recorded.
6. Attach a scintillation cell, vacuum hose, desiccant, filter, bilge pump, and flow meter as shown in Figure 2.2. All these valves (sampling valve on container, two scintillation cell valves) should be closed.
7. Open all three valves and then turn on the pump for half a minute. The flow rate should be adjusted to 10liters/minute.
8. Shut off the pump and then close the three valves.
9. Detach the scintillation cell from the line and label it with the proper sample number and measurement time.
10. Repeat steps 6-9 at 45 minute intervals for three hours.

11. The samples should sit undisturbed for three to five hours after collection before counting is attempted.
12. Counting is accomplished in the laboratory with an Eberline SAC-R5 alpha scintillation counter attached to an Eberline MS-2 scaler by a coaxial cable (or equivalent).
13. In order to count a sample the room lights should first be shut off and the coaxial cable disconnected.
14. A sample radon scintillation cell (containing aged nitrogen) is then to be placed into the detector chamber. After the removable chamber cover is replaced back onto the counter the room lights can be turned on and the scaler reconnected.
15. The lights should be turned off and the scaler reconnected whenever a scintillation cell or standard is put in or taken out of the counter.
16. The sample cell should be counted for ~~at least thirty minutes~~ *(2) two twenty (20) minutes counts*. Upon completion the rest of the samples are to be counted by the same procedure.
17. Each sample cell following counting should be flushed and sealed again with nitrogen. Thirty minute counts should then be performed to determine background cell activities for the next run.
18. A quality control on detector electronics is checked by placing an Eberline DNS-4 certified Th-230 source in the counter on top of a piece of ZnS paper and performing a thirty second count. The observed counting rate should be divided by the specific counting rates listed for the standard. If large changes in this value are observed between counting sessions, recalibration of the system may be necessary.

19. Net measured sample activities are obtained by subtracting the appropriate cell background reading (cpm) from each sample activity (cpm).
20. Net measured sample activities in cpm can be converted to net measured Rn activity concentrations in units of pCi of Rn for the 1.4 liter cells by dividing these activities by ¹5.5.
21. The Rn activity concentrations should be plotted against time after start of the radon accumulation in the container (in minutes).
22. A best-fit line through the data is found by linear regression analysis.
23. The radon exhalation flux in $\text{fCi}/\text{cm}^2\text{-sec}$ can be obtained from the slope of the best fit line ($\text{pCi}/\text{l-min}$) by the following relation:

$$\text{radon exhalation flux } (\text{fCi}/\text{cm}^2\text{-sec}) = \text{slope of the best fit line} \\ (\text{pCi}/\text{min-l}) \times \frac{V}{A_c} \times \frac{\text{min}}{60 \text{ sec}} \times \frac{10^3 \text{ fCi}}{\text{pCi}}$$

24. Site climatic conditions (temperature, barometric pressure, and precipitation) should be recorded from the nearest meteorological observation station for the entire period of Rn container collection. This information should be considered during data analysis.

3.2.3.2 Method II

Not used

Method II entails utilization of essentially the same apparatus used in Method I. It however involves taking only three consecutive samples at least thirty days after the collection container is installed into the ground. The method utilizes the fact that the time to sampling is sufficiently large that the ground exhalation rate (such as in fCi/sec) is approximately equal to the product of the activity

ATTACHMENT 9-8

BACKGROUND RADON-222 EXHALATION RATES

JACKPILE PAGUATE MINE AREA

<u>Site</u>	<u>Date</u>	<u>Rate</u> <u>pCi/m²/sec</u>
Black Mesa	2-6-79	<0.10
Black Mesa	9-19-79	4.49
West Rabbit Ears	3-14-79	0.84
West Rabbit Ears	9-24-79	0.84
Jackpile No. 4	12-20-78	5.21
Jackpile No. 4	7-19-79	3.74
Woodrow Area	12-29-78	3.10
Woodrow Area	9-10-79	4.41
N. Oak Canyon Mesa	12-21-78	0.17
N. Oak Canyon Mesa	9-6-79	1.21
S. Oak Canyon Mesa	2-7-79	0.26
S. Oak Canyon Mesa	9-18-79	0.21
Gavilan Mesa	3-8-79	0.11
Gavilan Mesa	9-20-79	0.50
Northwest Lease Corner	3-12-79	0.25
Northwest Lease Corner	9-25-79	3.05
Gamma Survey Control Grids		
North Lease	3-16-79	0.29
North Lease	9-5-79	3.10
North Oak Canyon Mesa	3-20-79	2.71
North Oak Canyon Mesa	9-17-79	4.97
Northeast Lease	12-27-78	3.43
Northeast Lease	9-21-79	1.15

QUESTION #14

Please provide a detailed description of the procedures to be used for closing the adits and declines, including the present condition of mine entries (size, existing support, etc.); composition of fill material, and allowances for settling; construction of seals or bulkheads in entries, etc.

RESPONSE #14

The adit dimensions and supports for each mine are as follows:

<u>Mine</u>	<u>Number of Adits</u>	<u>Dimensions (ft.)</u>	<u>Existing Support</u>
Alpine	2	8H x 10W	Wire mesh and roof bolts
H-1	2	8H x 10W	Wire mesh and roof bolts
P-10	1	8H x 16W	Steel sets with logging, wire mesh and roof bolts and concrete entry
P-13	2	8H x 10W	Wire mesh, roof bolts and concrete entry
P-7 (Vert. Shaft)	1	5H x 5W	Wood cribbing
PW2/3	4	8H x 10W	Wire mesh and roof bolts
NJ-45	3	8H x 10W	Wire mesh, roof bolts and concrete entry

Alpine

Two entries exist at the Alpine Mine and both were backfilled about 5 to 10 feet from the outside surface. No bulkheads have been placed in these adits. Each of the adits will be cleared of existing fill and a reinforced concrete bulkhead 12 inches thick will be constructed 15 to 25 feet inside the portal. The portal will be backfilled from the bulkhead to the portal entry with mixed overburden material. Tres Hermanos Sandstone will be placed over the buried entry to allow for subsidence and to serve as plant growth media. The immediate area of the portable entries will be contoured and seeded.

H-1

The H-1 Mine has 2 portals which are now covered by overburden material. One adit has backfill extending from the entrance into the portal for a distance of 20 feet and the other portal is covered only at the entrance. Each portal will be cleared of existing backfill and a 12-inch thick reinforced concrete bulkhead will be constructed a distance of approximately 25 feet from the portal entrance. The adit will be backfilled from the bulkhead to the portal entry with mixed overburden material. Tres Hermanos Sandstone will be placed over the portal entry to allow for subsidence and to serve as plant growth media. The immediate area of the portals will be contoured and seeded.

RESPONSE #14 (Continued):

P-10

The closing of the P-10 decline will be accomplished by constructing a 12-inch thick reinforced concrete bulkhead approximately 680 feet from the portal entrance. The bulkhead will be recessed 6 inches onto the wall, 3 feet into the floor and have steel pins penetrating 12 inches into the roof. The adit will be backfilled from the bulkhead to the entry with broken Mancos shale and Dakota sandstone. Tres Hermanos sandstone will be placed over the portal entry to allow for subsidence which may occur and to serve as plant growth media. The portal area will be contoured and seeded.

P-13

The two portals of the P-13 mine are located within South Paguate Pit. The backfill elevation as proposed in the March 1982 Reclamation Plan will entirely cover the P-13 portals. These portals will be backfilled with waste material for a distance of about 25 feet and the portals covered by the planned pit backfill. The depth of backfill over these portals is approximately 65 feet.

P-7

The P-7 escape shaft lies within the confines of South Paguate Pit. The vertical shaft is 45 feet deep and the opening is at the proposed final backfill elevation. The entrance is presently secured by a locked lid covering the opening. It is proposed that the shaft be plugged by one of the methods planned for sealing the underground ventilation shafts. The basic procedure consists of a concrete plug extending from the collar to 10 feet downshaft. Detail of the plugging procedure can be found in Response #15.

PW-2/3

The PW 2/3 Mine has four adits within North Paguate Pit and all have been sealed. The number 1 and number 3 adits were bulkheaded with wood structures 15 feet inside the entry. This area was then filled with primarily shale overburden material. The number 2 and 4 adits were backfilled over the entry. The backfill is presently piled approximately 50 feet deep over these entries.

NJ-45

All three adits to the NJ-45 Mine lie within the confines of Jackpile Pit and will be covered by proposed pit backfill. These adits will be backfilled with waste material for a distance of about 25 feet inside the portal and the portals covered by the planned pit backfill. The depth of backfill over these adits will range from 20 to 40 feet.

QUESTION #25

The plan provides only one cross-section for the FD-1 dump slope, and it is difficult to determine how much modification of the slope is being proposed. Please provide additional cross-sections or a discussion which further defines the modifications that are being proposed for this dump slope.

RESPONSE #25

Cross-sections O-O' and P-P' found in Volume 3 of the March 1982 Reclamation Plan depict the proposed slope modifications of FD-1 on the Southwest and Northwest sides of the dump. Attached are three additional cross-sections and a revised plate 6.3-1 which shows the cross-section locations with post-reclamation topography. Cross-section 1,013,200N is situated East-West and cross-sections 1,003,000E and 1,005,000E are running North-South. For detail regarding topsoil and cover proposed for FD-1, consult Table 6.1-2 of the March 1982 Reclamation Plan.

ATTACHMENT 9-4

AMBIENT RADON-222 LEVELS (pCi/l)
AT MONITORING STATIONS IN VICINITY
OF JACKPILE-PAGUATE MINE

<u>Sample Location</u>	<u>Feb. '79-June '79</u>	<u>July '79 - Sept. '80</u>		<u>Oct. '80 - Dec. '81</u>	
	<u>Range</u>	<u>Range</u>	<u>Average</u>	<u>Range</u>	<u>Average</u>
Dump F	0.68 - 0.88	0.06-2.01	0.74	1.30-3.14	2.07
Mine Vent (P-10)	0.36 - 0.59	0.10-1.56	0.71	0.72-3.68	2.10
West Gate	0.56 - 0.72	0.06-1.90	0.62	1.13-2.17	1.48
Well #4	0.21 - 0.32	0.01-1.13	0.32	0.90-2.78	1.98

RADIUM 226 DETERMINATION

(Public Health Service Method¹)

Introduction:

This procedure is set up primarily for assaying Radium 226 in water samples. However, if analysis of organic or solid sample is necessary this procedure is to be preceded by the digestion outlined in Leaching Method of Digestion.

Range:

.001 pico curies/l to 1000 pico curies/l

Apparatus:

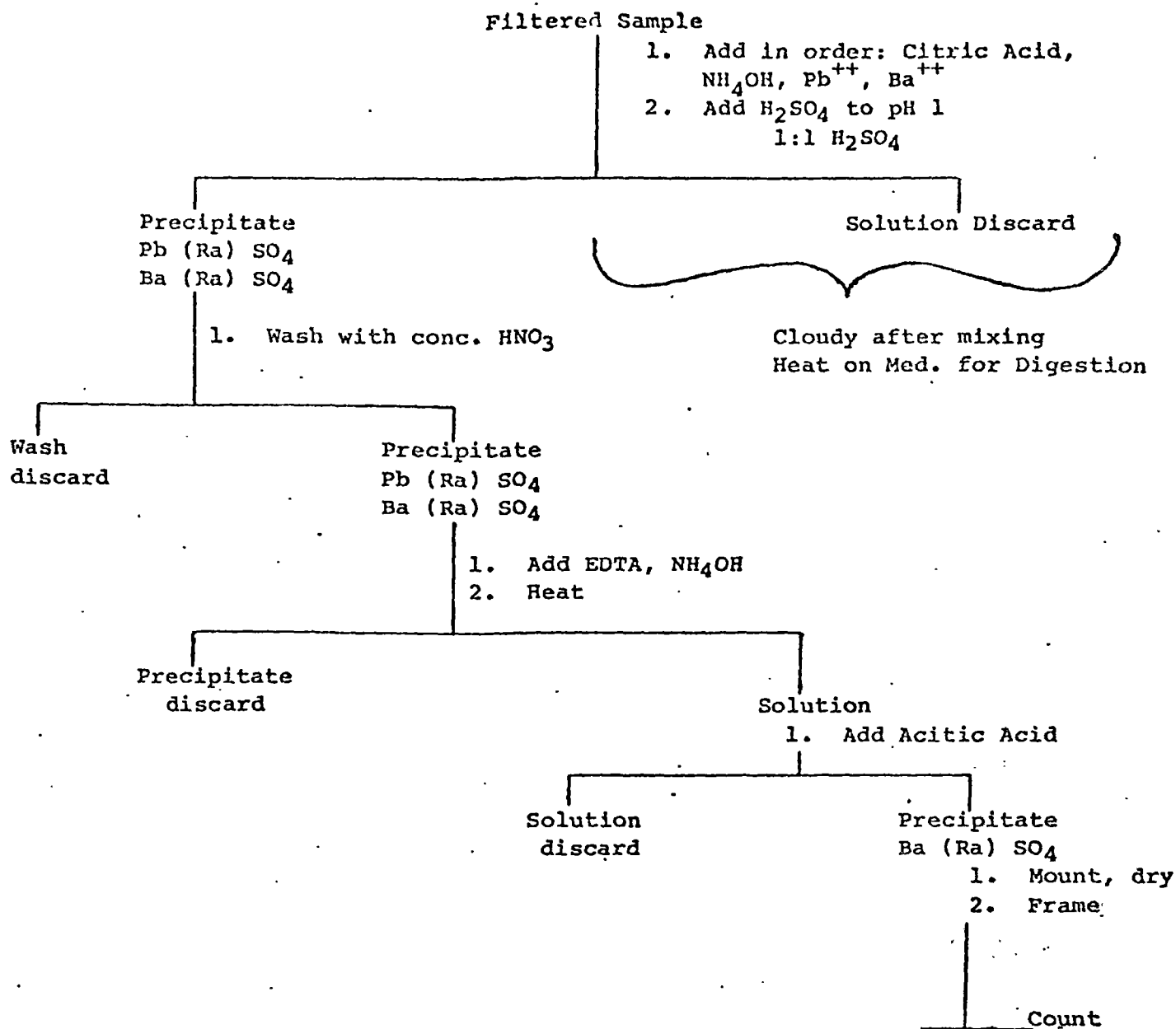
1. Alpha Counter
2. Centrifuge
3. Infra Red Lamp
4. Metal Planchets

Reagents:

1. Citric Acid 1 M: 210.01 gms/l
2. Lead Nitrate, Pb (NO₃)₂, 1 N: 210 gm/liter
3. Barium Nitrate, Ba (NO₃)₂, 0.1 N: 13.07 gm/liter
4. Sulfuric Acid, H₂SO₄ 1:1 (vol/vol)
5. 0.25 M EDTA: 93 gm/l disodium salt (dihydrate)
1 liter H₂O (add 5-10 ml NH₄OH to facilitate solution)
6. 6 N NH₄OH, 100.7 ml/250 ml
7. Methyl orange dissolve .05 g in 100 ml distilled water.

¹Goldin, A.S., "Determination of Dissolved Radium", Manuscript, Robert A. Taft Sanitary Engineering Center, U.S. Public Health Service, Cincinnati 26, Ohio.

Flow Diagram of Procedure:



Procedure:

A. 1. To a 500 ml sample of filtered water*, add in order, while stirring:

.5 ml 1 M Citric Acid
2.5 ml Conc. NH_4OH
2 ml 1 N $\text{Pb (NO}_3)_2$
1 ml 0.1 N $\text{Ba (NO}_3)_2$

*Tailings samples: use 100 ml of filtered sample.

Procedure Continued

2. Heat to boiling; while stirring, add 10 drops methyl orange and add 1:1 H_2SO_4 until a pink color is attained, then add 0.25 and in excess. (Total 2 ml).
3. After stirring for about 20 minutes, remove the stirring bar and allow the samples to stand over-nite, or until completely clear.
4. Decant most of the solution then centrifuge the remaining solution in 50 ml centrifuge tubes; discard supernate.
5. Wash twice with 10 ml HNO_3 washes, discarding the wash.
6. Dissolve the precipitate in 10 ml water, 10 ml EDTA solution and 3 ml of 6 N NH_4OH solution adding the solutions in the order above. Mix until ppt. is in solution.
7. Three (3) hours before counting, add 2 ml of Glacial Acetic Acid (slowly). If no ppt is formed, add 2 more ml Acetic Acid. If no ppt is formed, add 5 ml of 50% $(\text{NH}_4)_2\text{SO}_4$.
8. One (1) hour before counting, centrifuge and discard supernate. Wash with 15 ml distilled water, centrifuge and discard wash.
9. Transfer ppt to a clean planchet and dry under an infrared lamp.
10. Heat the planchet red hot on a Bunson Burner 3 minutes before counting.
11. Count for 20 minutes in the Gas Flow proportional counter. Repeat this step once.

Standard Preparation:

A 25 pCi/l stand. is usually used. To prepare the standard, dilute 0.25 ml of an 0.1 uCi/ml standard solution to one (1) liter. After mixing, the standard is treated exactly as a water sample.

At least 2 standards are run with each set of samples.

Calculations:

The method used to calculate the Ra-226 value from the Alpha counts determined in this procedure is written on a TI-59 Program Card. The program record is included with this procedure.

PROGRAMMER PL DATE 3-27-81

Program Record

Partitioning (Op 17) 1 Library Module NO Printer Yes Cards 1

PROGRAM DESCRIPTION

Calculation of Ra-226 using A.S. Golden Procedure.

2 std cts, 2 samp cts after 3 hr

time factor can

2 std cts, 2 samp cts after 168 hr

be changed

1σ standard deviation calculated.

USER INSTRUCTIONS

STEP	PROCEDURE	ENTER	PRESS	DISPLAY
1	Initialize program	LBL A	2nd LBL A	Enter Blk.
2	Enter Blk.	Blk cpm	R/S	Enter Vol.
3	Enter Vol.	Vol in ml	R/S	Enter fst std
4	Enter First std cts	Std in cpm	R/S	Enter Sec cts
5	Enter Sec std cts	"	R/S	Enter fst cts
6	Enter First sample cts	Sample in cpm	R/S	Enter Sec cts
7	Enter Sec sample cts	"	R/S	Calculating
8	Calculation of results			Answer in uCi/ml
9	Calculation of 1σ SD			value of std dev.
10	Results to LBL B go to step 6 in procedure	Fst cts Sec cts	R/S R/S	R/S R/S

USER DEFINED KEYS	DATA REGISTERS (INV) (CF)	LABELS (Op 08)
A Initialize	0 0 std cts-Bkg.	0 Bkg in cphr.
B Reset to sample cts	1 3hr sample ctr	1
C	2	2 7 day sample cts
D	3 3hr factor	3
E	4	4
A'	5	5
B'	6 sample vol. factor	6
C'	7 7 day factor	7
D'	8	8
E'	9	9
FLAGS	0 1 2 3 4 5 6 7 8 9	

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1014956 1

RADIUM ANALYSIS DATA SHEET

A.S. G' DEN

Background Count: _____
 Average Background Count: _____
 Counting Time: _____
 Background Counting Rate: _____
 Volume of Sample: _____

Analyst: _____
 Date: Set-up: _____
 First Reading: _____
 Second " " : _____
 t₂ = _____ days

Sl. No.	Sample Date	Description or Source	Final Ppt.		Counting Time	Counted		Total Counts		Results uCi/ml	Results pCi/L
			Date	Hour		Date	Hour				
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											

New Mexico Operations

PREPARATION OF SOIL SAMPLE

1. Approximately 200-250 grams of a soil sample is placed on a tray and placed in the oven for \pm 14 hours. The oven is set at 175 °F.
2. The sample is then allowed to cool. Take the sample and run it through a Jaw Crusher and then a splitter.
3. The soil sample is then mixed thoroughly, and then placed in a pulverizer.
4. After the soil sample has gone through the pulverizer (-100 mesh) it is then placed on rolling paper and again it thoroughly mixed.
5. The soil sample is then placed in a sample bag and properly labeled and dated.

ACID LEACHING METHOD OF DIGESTION

1. Weigh out approximately 2 grams of solid sample and place in a 250 ml beaker. Slightly wash down the sides with distilled water.
2. Add 10 ml of mixed acid, 1 part Perchloric Acid and 4 parts Nitric Acid. Also, add 2 boiling chips.
3. Place on a hot plate and cover the beaker with a watch glass. Heat the sample until heavy nitric vapors are formed.
4. Then add 2-3 drops of Hydrofluoric Acid and evaporate down to \pm 2 mls.
5. Add 10 mls concentrated Nitric Acid and acid leach for approximately 10-15 minutes.
6. Wash down the sides of the beaker and watchglass with distilled water and allow to cool.
7. Filter the sample through a Whatman #2 Filter Paper and then dilute the sample to 1 liter, using distilled water.

ATTACHMENT 9-6

BACKGROUND RADIUM-226 LEVELS IN SOILS
IN VICINITY OF JACKPILE-PAGUATE MINE

<u>Sample Location</u>	<u>Radium pCi/g</u>
Northeast Corner of Lease	0.37
North Lease	0.74
Woodrow Peripheral	0.56
Northeast Lease	0.71
Gavilan Mesa	0.81
Southeast Lease	1.90
#4 JP Well	0.10
North Lease (Near Hamilton)	0.32
West of Rabbit Ears	0.11
West Corner of Lease	0.15
North Oak Canyon Mesa	0.39
North Oak Canyon Mesa (above shop)	0.77
Oak Canyon Mesa (south of shop)	0.20
Oak Canyon Mesa (southeast of shop)	0.40
South Oak Canyon Mesa	0.14
Black Mesa Flux Site #4	0.38
Black Mesa (west above shop)	0.22
Black Mesa (above P-10 Vent #1)	0.10
West of South Pagate Pit	0.08
Northwest of South Dump	0.12
Gamma Survey Control Grids	
North Lease	0.10
North Oak Canyon	0.20
Northeast Lease Corner	0.58

Note: Samples taken 10-16-79 except those from gamma
survey control grids, which were taken 4-20-79.

Table 2.9A. BACKGROUND RADIATION LEVELS AS MEASURED BY
THERMOLUMINESCENT DOSIMETERS

Sites*	Radiation Exposure (mRem)			Annual**
	30 days	60 days	90 days	
TLD-1	15	21	37	149
TLD-2	13	25	44	175
TLD-3	13	24	40	161
TLD-4	12	20	34	135
TLD-5	13	25	36	146
TLD-6	13	22	31	124
TLD-7	14	29	39	157
TLD-8	11	23	31	124
TLD-9	10	21	35	139
TLD-10	10	29	31	124
Mean:				143

*See Figure 2.9A for TLD exposure site locations.

**An extrapolation based on the 90-day exposure results

order of 140 millirems (mRem)* per year. This computed level seems lower than would be expected from local geology and topography. Hence, a value of 170 mRem per year has been used as the background exposure rate in other computations in this environmental report.

RADIOACTIVE MATERIALS

Air

Airborne radioactive materials in the site vicinity are in the form of dust and radon gas. The dust could come from surface soil and rock that contain radioactive materials from other mining or exploratory operations in the vicinity or from radon daughter products. Particles therefore vary from sand and silt sizes (given high winds which occur commonly) down to molecular sizes. Actually, the very fine solid radon daughters normally form using a larger nonradioactive dust particle as a nucleation site and therefore do not behave like the aerosols. The radon present in the ambient air at the site is a decay product of radium in native soil and rock.

Background levels of airborne contaminants were measured three times on the project. High-volume air filters, drawing 50 to 60 cu ft per minute through membrane filters, were run 3 to 3.5 hours consecutively on three occasions. The particulate matter retained on the filters was analyzed for its radiological properties. Table 2.9B presents the results, and Figure 2.9A indicates the sampling locations. Samples were collected under a variety of climatic conditions.

*One millirem is defined as that quantity of any type of ionizing radiation which, when absorbed by man, produces an effect equivalent to the absorption by man equal to 0.001 of a roentgen of x-ray or gamma radiation (400 KV).

ATTACHMENT 9-2

GAMMA RAY EXPOSURE RATES
ON CONTROL GRIDS
JACKPILE-PAGUATE MINE AREA

<u>Gamma Survey Control Grid</u>	<u>Date</u>	<u>Number Of Measurements</u>	<u>Levels in uR/hr</u> <u>Average</u>	<u>Range</u>
North Lease	3/23/79	20	9.7	8-11
North Oak Canyon Mesa	3/20/79	17	7.9	5-9
Northeast Lease Corner	1/8/79	17	9.5	8-11
Northwest Lease Area	5/82	15	13.2	11-15

Radiation

FA

Ambient Airborne
Radioactivity Measurements
in the Vicinity of the
Jackpile Open Pit
Uranium Mine
New Mexico

ATTACHMENT 9-3

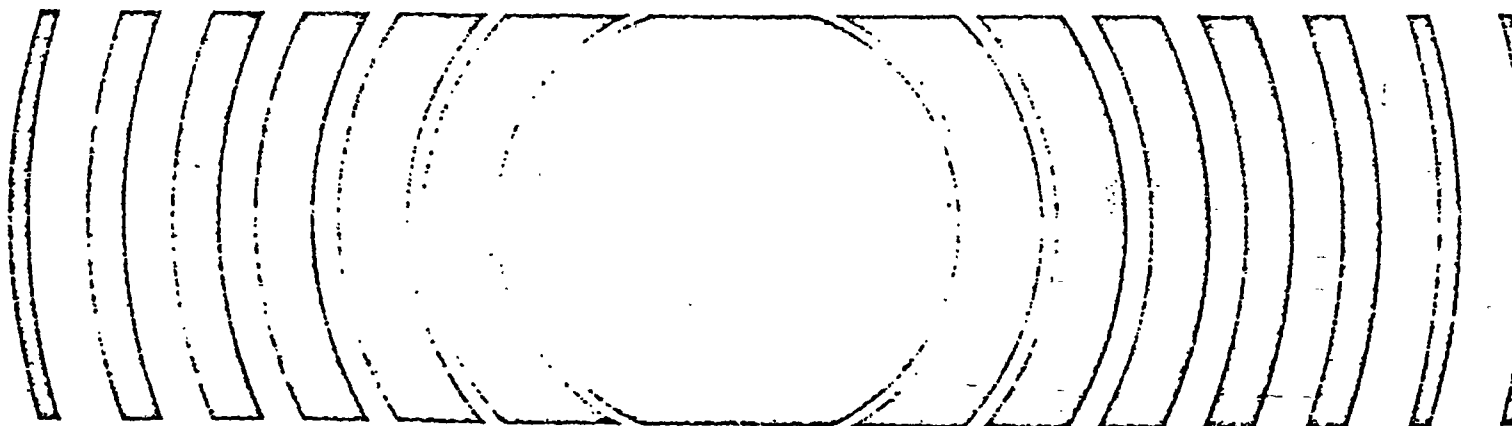


TABLE 2. AMBIENT OUTDOOR RADON-222 CONCENTRATIONS (in pCi/l) DURING JULY 1976
IN THE VICINITY OF THE JACKPILE OPEN PIT MINE, NEW MEXICO

Location, Description	Maximum Concentration*	Minimum Concentration*	Average Concentration**
Old Laguna-(#1)	1.3 ± 0.18	0.20 ± 0.10	0.51 ± 0.28
Laguna- Training Bldg. (#2)	1.5 ± 0.39	0.14 ± 0.07	0.51 ± 0.29
IHS-Laguna Health Center	1.6 ± 0.19	0.22 ± 0.11	0.63 ± 0.36
Bibo-Wellhouse	1.4 ± 0.29	Less than 0.12	0.50 ± 0.23
Mesita-Industrial Plant (#1)	0.89 ± 0.33	0.18 ± 0.05	0.47 ± 0.31
Mesita-Community Building (#2)	1.7 ± 0.22	Less than 0.12	0.55 ± 0.49
Moquino-Private Residence	1.4 ± 0.23	Less than 0.12	0.54 ± 0.31
Paguete-Community Building	0.74 ± 0.06	Less than 0.12	0.42 ± 0.14
Jackpile Mine- Company Housing Area	1.8 ± 0.23	0.25 ± 0.10	1.1 ± 0.34
Railroad Trestle (#1) Below Jackpile housing area	2.1 ± 0.26	Less than 0.12	0.99 ± 0.54
(Location #2)-One mile south of Railroad Trestle (#1)	2.7 ± 0.24	0.44 ± 0.05	1.3 ± 0.50

*{ Excluded
Influenced
by Mining }*

* Source of Analyses: Eberline Instrument Corporation, Albuquerque, New Mexico
Result ± Two-Sigma Counting Error Terms

** Average Result ± Two-Standard Error Terms (i.e., standard deviation of the sample
population divided by the square root of the number of samples)

100-RANGE-26 (BACK)

Work Sheet

Notes

1. Big Bluestem	Side Oak	Big Bluestem	Little Bluestem	Rodent	Jack Pine	Smooth Birch	Other	Pine	Western White	Juniper	Spotted	3 arm	Spruce	Maple
2. 10	30	T	T	T	T	T	T	T						
3.	28			T	T	10		T	T	11				
4.				1	T			T						
5.				1	26			T		2	2			
6.	T			T				T		2	1			
7.					1					T		15	1	
8.					20	T						20	1	3
9.				T	10			T		3		2		
10.					1						15	25		
11.	10	2			4	T	T		1	1				
12.														
13.														
14. Avg. Core														
15.	9/1/50.4													
16.	17/50.4													
17.	11/50.4													
18.	13/50.4													
19.														
20.														
Total ¹⁰	50	31	T	4	28	43	1	3	1	18	19	62	2	3
Ave. ^{1.2}	5.0	3.1	T	.4	2.8	4.3	.1	.3	.1	1.8	1.9	6.2	1.2	.3

Small
climber very
good stand.
The spp.
Smooth Bark
Little Bluestem

GUIDE FOR DETERMINING TREND
(Sec. 370.1 - National Range
Handbook)

Long Term Indicators	4	3	2	1	0
Plant Vigor		X			
Reproduction		X			
Composition Changes	X				
Plant Residue		X			
Soil Surface Conditions		X			

Sub-Totals
RANGE TREND:
Improving (10+) 16
Declining (-10)

QUESTION #9

Please provide the data and a discussion of the methods used to develop the radiation background values found on Page 19.

RESPONSE #9

The following are the values referred to:

"Numerous measurements over a number of years indicate that the background gamma ray exposure rate in the vicinity of the mine averages about 10-25 uR/hr."

"Based upon recent data acquired by Anaconda and its consultants, ambient background radon-222 concentrations range from about 0.42 to 1.1 pCi/l and background radium-226 soil concentrations range from 0.10 to 1.90 pCi/g. Radon-222 flux (exhalation) has ranged from 0.10 to 5.21 pCi/m²/sec in background areas."

The values cited are based on the following studies:

Gamma Ray Exposure Rate

1. A radiological assessment of Paguate Reservoir was conducted in October and November, 1980 by Eberline Instrument Corporation for Anaconda Copper Company. ("Report, Radiological Characterization of Paguate Reservoir at Laguna, New Mexico.") A copy of this report was previously submitted to U.S.G.S.

A direct gamma radiation survey was conducted in the vicinity of the reservoir area. Gamma readings were recorded on a 200-foot matrix grid across the reservoir in a north-south and east-west direction. Approximately 1,500 survey points were measured, utilizing Eberline PRS-1 portable scaler/ratemeters with SPA-3 NaI(Tl) two-inch by two-inch scintillation detectors. The same detectors height (one-meter) was employed to read the gamma radiation at each survey point. Multiple gamma readings were made at each location and the average value obtained from these readings recorded.

This study showed that the arithmetic mean and its associated standard deviation was 18.25 ± 6.54 , indicating that with 68 percent confidence, 11.71 to 24.79 uR/hr represent the background range of all the readings in the Paguate Reservoir area.

2. A study of background radiation was conducted in 1973 at the L-Bar Uranium Mine and Mill for Sohio Petroleum Company and Reserve Oil and Minerals Corporation. Special weatherproof thermoluminescent dosimeter (TLD) packets containing high-sensitivity lithium fluoride chips were placed at 10 monitoring points on and around the project site. The TLD's were exposed for 30, 60 and 90 days and were then analyzed to determine the amount of radiation to which they had been exposed.

This study concluded that the mean background radiation level at the site was on the order of 140-170 mRem/year or 16-19 uR/hr.

This report is in the files of the New Mexico EID and is therefore a public document. Applicable pages of this report are appended as Attachment 9-1.

RESPONSE #9 (Continued)

3. Measurements of gamma radiation were conducted during 1979 and 1982 by Anaconda personnel at the four gamma survey control grids shown on Plate 5.2-1 of the Reclamation Plan. An Eberline PRM-7 or Ludlum 12S portable scintillation-type survey meter was used and readings were taken at one meter above ground surface.

Attachment 9-2 summarizes this data which shows exposure rates ranging from 5-15 uR/hr with averages at four sites ranging between 8-12 uR/hr.

Ambient Radon-222 Concentrations

Ambient background radon-222 levels cited in the Reclamation Plan are the average concentrations determined during June, 1976 by Eberline Instrument Corporation in samples obtained in the vicinity of the Jackpile-Paguete Mine and presented in the U.S. EPA publication "Ambient Airborne Radioactivity Measurements in the Vicinity of the Jackpile Open Pit Uranium Mine, New Mexico" (January, 1979). A table summarizing this data is appended as Attachment 9-3. All of the locations noted in the table with the exception of "Jackpile Mine - Company Housing Area" are probably sufficiently distant from the influence of mining activities to be considered "background." The ambient radon-222 levels observed at these sites ranged from less than 0.12 to 2.7 pCi/l and averaged 0.42 to 1.3 pCi/l at the 10 background sites.

The statement in the Reclamation Plan did not include the ranges and averages determined by Anaconda's in-house monitoring although summaries of this data have been submitted to U.S.G.S. on August 19, 1979 and February 10, 1981 as well as in response to Question #4. The sites at which this data was collected have all been influenced to some extent by mining activities and the levels, therefore, are not truly representative of "background."

From February, 1979 through July, 1980 one 48-hour sample was taken monthly at each of the four air monitoring stations indicated on Plate 5.2-1 of the Reclamation Plan. These samples were collected in 30-liter Tedlar bags using a modified aquarium pump, transferred to a scintillation cell, and counted using EPA-approved methods. Sampling height was approximately one meter above the ground.

Since August, 1980, ambient radon-222 levels have been determined by Eberline Instrument Corporation RGM-2 units set up at each of the same four sampling locations. These units provide continuous radon monitoring with hourly printouts and a 24-hour average. The 24-hour averages are recorded on a summary sheet for each month and a monthly average is calculated for reporting purposes.

The Anaconda data, summarized on Attachment 9-4, indicates that from February, 1979 through September, 1980, average monthly ambient radon levels ranged from 0.01 to 1.90 pCi/l and generally averaged less than 1 pCi/l. From October, 1980 through December, 1981, average monthly levels ranged from 0.72 to 3.68 pCi/l and averaged about 2. The increase during the latter period is undoubtedly due to a change in analytic methodology rather than change in ambient radon levels per se. Data obtained from the RGM-2 units is thought to be more reliable.

RESPONSE #9. (Continued)

Radium-226 Concentrations in Background Soils

During 1979, Anaconda obtained surface soil samples at 23 sites in the vicinity of the Jackpile-Paguate Mine which were thought to be representative of background soils. Soil samples were oven-dried, pulverized and a sample of the -100 mesh portion subjected to nitric-perchloric-hydrofluoric acid digestion. The leachate was further treated and radium-226 concentration determined by 20-minute counts in an alpha particle gas flow proportional counter as described in the procedure appended as Attachment 9-5. As shown on Attachment 9-6, the radium-226 levels ranged from 0.10 to 1.90 pCi/g and averaged 0.41 pCi/g.

Background Radon-222 Exhalation Rates

Radon flux determinations were made at several background sites by Anaconda during late 1978 and 1979. The method used was a modification of the Bernhardt technique as described in Attachment 9-7 and consisted of determining flux from radon and progeny activity measurements of samples withdrawn from a modified 55-gallon drum sealed into the ground.

The results of these flux determinations, summarized in Attachment 9-8, show rates ranging from less than 0.10 to 5.21 pCi/m²/sec and averaging 2.01 pCi/m²/sec for the 22 samples.

ATTACHMENT 9-1

Project 73-634

APPLICANT'S ENVIRONMENTAL REPORT

**L-BAR URANIUM
MINE and MILL**

— VALENCIA COUNTY, NEW MEXICO —

Proposed by · SOHIO PETROLEUM COMPANY
and RESERVE OIL AND MINERALS CORPORATION

Albuquerque, New Mexico

August 1974

2.9 BACKGROUND RADIOLOGICAL CONDITIONS

Since much of the public concern over the proposed project's environmental impact may focus on its potential release of radioactive materials, it was important to establish baseline information on background radiation levels and concentrations of radioactive materials. Field exposure measurements have been made; and soil, plant, small animal, and water samples collected on the site and in the surrounding vicinity have been analyzed. Results indicate that this area has levels that are typical of this part of the state but higher than the United States on the whole. This situation is as would be expected. The site area is at an elevation of 6200 to 6500 ft and receives considerable radiation from cosmic rays. Further, the rock and soil of this general locale contain a comparatively high concentration of radioactive materials - hence its exploitation as a principal source of the nation's uranium. The presence of such materials in the rock and soil accounts for their presence in water, air, and biota. Although it is possible that man's activities in exploring and mining for uranium at several nearby locations has raised the background level somewhat, it is believed that the levels have changed little over many years.

RADIATION LEVELS

Background radiation from all sources was measured in the field by means of thermoluminescent dosimetry techniques. Special weatherproof thermoluminescent dosimeter (TLD) packets containing high-sensitivity lithium fluoride chips were placed at 10 monitoring points on and around the project site. These TLD's were exposed for 30 days, 60 days, and 90 days at the sites indicated on Figure 2.9A, and were then analyzed to determine the amount of radiation to which they had been exposed. Exposure data for all 30 TLD packets are presented in Table 2.9A. An extrapolation of the measurements made over three months of exposure indicates that the mean background radiation level at the site is on the

● TLD 2

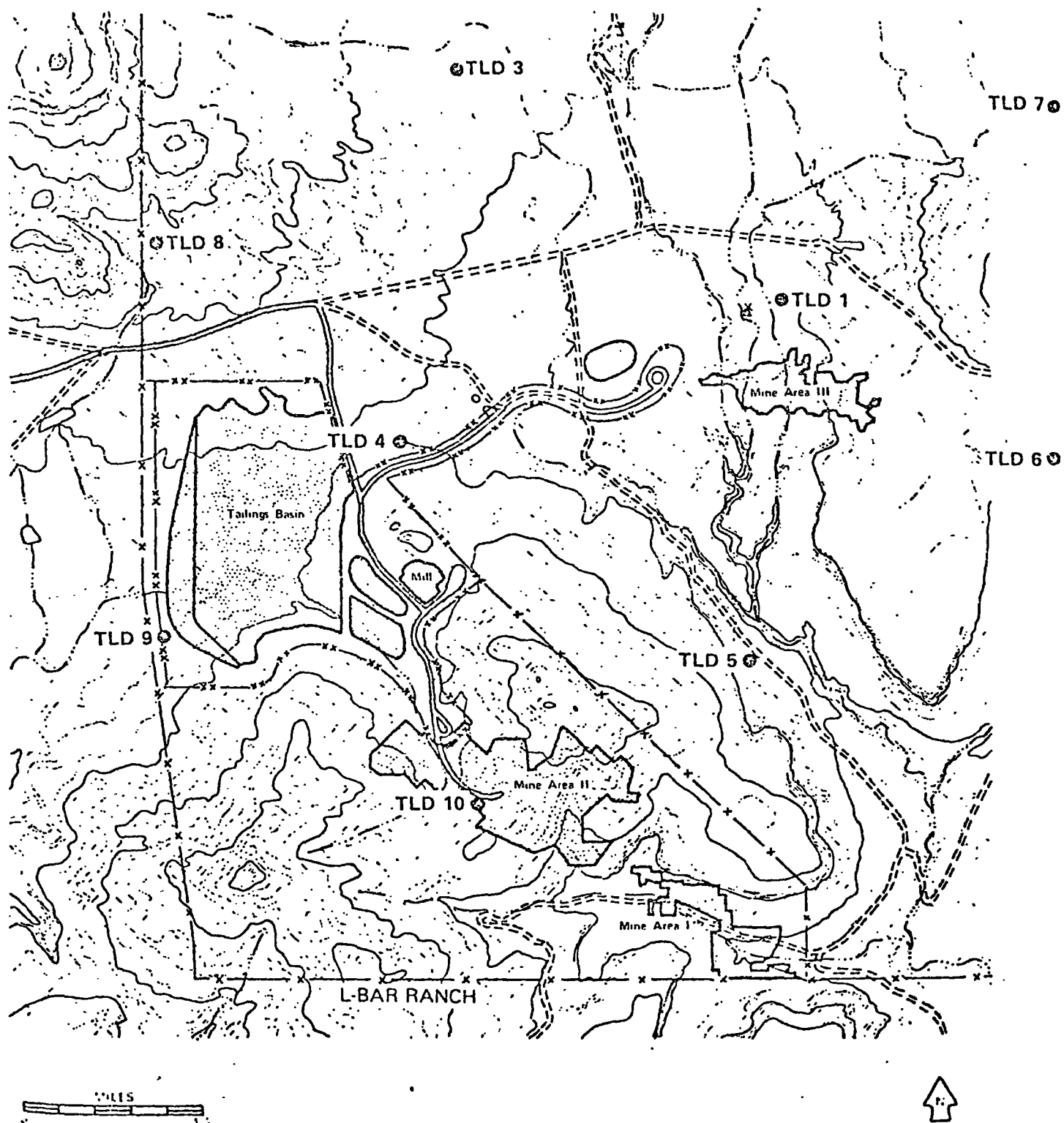


Figure 2.9A. THERMOLUMINESCENT DOSIMETER EXPOSURE SITES

RANGE CONDITION WORKSHEET

Location T.B. Dump Range Site Mesa Top (Loamy)
 Store Dump I, Relined L. R. A. WP-2 (SD-2)
 Operating Unit _____ Date _____ By _____

Species	Present Production Occular Est. Double Sampled Pounds Per Acre Kilograms per Hectare	Present Percent of Total Production	COMPOSITION Allowable 1/ Percent of Total Production	Counted in Condition Rating
Grasses				
Wandering Tonic	14.7	14	15	14
W. Wheat	5	4	15	4
Sideoats Gramma	6	5	15	5
Indian rice grass	2	2	15	2
Blue Gramma	2	2	10	2
Squirrel Tail	1	1	7	1
Feathered Wheat	3	3	-	-
Shrubs, half shrubs, vines & trees				
Yucca	190	184	10	10
Herbs				
Chenopodium	70	7		
Prickly Pear	250	247	-10	10
Kochia	354	34		
Annuals	1	1		35.4
Total	1028			

Range Trend Up ☒ Down ☐ (See reverse) Range Condition (Ecological) _____
 Percent Density 10 % Range Condition Class _____

See Natural Potential Plant Community section of Range Site Description. Not to exceed the upper limit of the approximate range in % composition for the individual species.

1. Yucca low	Cholla	Washington olive	Sagebrush	Artemisia	Joshua tree	Blue cholla	Koeber	Parry tree	Yucca	Spurred Tree	Crested tree
2. 18	70	T	1	1							
3. 51		T				T	69	110			
4. 75		T	T				25	T	T		
5.			T		T		20	T			
6.							15	T			
7.			T				25	T			
8.		T	T	T	T	T	175	108	1		
9.		3	1		T	T	5	20	150	1	
10.			1			T	20	10	37		3
11.		T	1		T		T	T	2		T
12.											
13.											
14.											
15.											
16.											
17.											
18.											
19.											
20.											
Total ¹⁴⁴	70	5	6	1	2	2	354	250	190	1	3
Ave ¹⁴⁴	7.0	.5	.6	.1	.2	.2	35.4	25	19	.1	.3

Reseeded area.
seedlings had good
start but turned
very dry. Will
die if no rain
soon.

GUIDE FOR DETERMINING TREND
(Sec. 370.1 - National Range
Handbook)

Long Term Indicators	4	3	2	1	0
Plant Vigor			X		
Reproduction		(2)		X	
Composition Changes		X			
Plant Residue	X				
Soil Surface Conditions		X			
Sub-Totals					
RANGE TREND:					
Improving (10+)	13				
Declining (-10)					

Locality 2.4 Flap. Range Site Cherry Upland
 Feature 1st of blackness L. R. A. WP-2
 Collector Jack Piles Date 6/17/80 By R. Oberwiesing

Range Condition (Ecological) 56Range Condition Class Good

1/ Potential Plant Community section of Range Site Description. Not to
 -- ~~show the upper limit of the approximate range in % composition for the individual~~

	3000	6000	9000	12000	15000	18000	21000	24000	27000	30000
1.	7	12	1	2	80					
2.	17	22	12	1		T				
3.	7	18	1	2	80					
4.	T	4	T	25						
5.	5	10		15		T				
6.	5	5	2	30		1				
7.	5	15	2	1		T	10			
8.	7			5		T				
9.	10	20	T	4		T				
10.	8	2		12						
11.	6		12			T				
12.										
13.										
14.										
15.										
16.										
17.										
18.										
19.										
20.										
Total	62	102	18	107	80	T	5	10		
Ave.	62	102	1.8	10.7	8.0		.5	1.0		

Needle & Thread scotch
 Fringed sage scotch
 but lodged close.
 winter fat.

GUIDE FOR DETERMINING TREND
 (Sec. 370.1 - National Range
 Handbook)

Long Term Indicators	4	3	2	1	0
Plant Vigor		X			
Reproduction		X			
Composition Changes		X			
Plant Residue			X		
Soil Surface Conditions		X			

Sub-Totals

RANGE TREND:

Improving (10+) 14

Declining (-10)

RANGE CONDITION WORKSHEET

Station BB Bellanca Area Range Site Looney Island (playas)

Location Dump 5, National L. R. A. WP-2

Rating Unit _____ Date 6/15/80 By R. R. Rasmussen

Species	Present Production	COMPOSITION		Counted
	Ocular Est. Double Sampled <input checked="" type="checkbox"/> Pounds Per Acre <input checked="" type="checkbox"/> Kilograms per Hectare	Present	Allowable 1/	in Condition Rating
		Percent of Total Production		
<u>Spurred Owl</u>	<u>7</u>	<u>-</u>	<u>5</u>	<u>7</u>
<u>Blues Grass</u>	<u>78</u>	<u>35</u>	<u>15</u>	<u>15</u>
<u>Indian Rice</u>	<u>11</u>	<u>5</u>	<u>5</u>	<u>5</u>
<u>Crested Wheat</u>	<u>12</u>	<u>5</u>	<u>-</u>	<u>-</u>
<u>Sand Dropseed</u>	<u>11</u>	<u>5</u>	<u>5</u>	<u>5</u>
<u>Ikali Sacaton</u>	<u>83</u>	<u>35</u>	<u>15</u>	<u>15</u>
<u>Weeping Live grass</u>	<u>10</u>	<u>4</u>	<u>-</u>	<u>-</u>
<u>Silene</u>	<u>7</u>	<u>7</u>	<u>-</u>	<u>-</u>
<u>Subs, half shrubs, vines & trees</u>				
<u>Yucca</u>	<u>18</u>	<u>9</u>	<u>5</u>	<u>5</u>
<u>Snake Weed</u>	<u>7</u>	<u>7</u>	<u>5</u>	<u>7</u>
<u>Fls</u>				
<u>Annals</u>	<u>4</u>	<u>3</u>	<u>15</u>	<u>3</u>
Total	228	3	65	

Range Trend Up _____ Down _____ (See reverse) Range Condition (Ecological) 49

Plant Density 5 ☒ Range Condition Class _____

*See Natural Potential Plant Community section of Range Site Description. Not to exceed the upper limit of the approximate range in % composition for the individual species.

RANGE CONDITION WORKSHEET

Location 3 Dunes Range Site approximates shallow
Pasture 3 mps reclaimed L. R. A. _____
Operating Unit _____ Date _____ By _____

Species	Present Production Occular Est. Double Sampled _____ Pounds Per Acre ✓ Kilograms per Hectare _____	Present Percent of Total Production	COMPOSITION Allowable 1/	Counted in Condition Ratio
<i>Sid oats</i>	50	21	15	15
Grasses <i>Big Blue Stem</i>	10	4	10	4
<i>Blue Grama</i>	31	13	15	13
<i>Alkali Sacaton</i>	7	-	-	-
<i>Indigo Rice</i>	28	12	10	10
<i>Western Wheat</i>	19	8	5	5
<i>Sand Pansy</i>	2	1	10	1
<i>Ring mulley</i>	3	1	5	1
Shrubs, half shrubs, vines & trees				
<i>4 wing</i>	18	8	5	5
Forbs				
<i>Kochia</i>	4	2		
<i>Russian Thistle</i>	3	1	3	
<i>Annuals</i>	1	5		
				54
Total	232	100		

Range Trend Up ☒ Down _____ (See reverse) Range Condition (Ecological) Good

Plant Density 12 % Range Condition Class Good

1/ See Natural Potential Plant Community section of Range Site Description. Not to exceed the upper limit of the approximate range in % composition for the individual species.

10 mps hix. Big blue stem substituted for little blue stem